

Design Optimization in a Conventional Tunnelling Project in Urban Area using the Observational Method-Niayesh Road Tunnel in Tehran, Iran

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1 INTRODUCTION

Tunnelling as an environmentally preferable means is increasingly being used world-wide to provide the infrastructures such as transportation and utilities required for sustainable urban communities. During designing of a tunnel there are parameters with varying degree of uncertainty that must be taken into account. These uncertainties are often related to sub-surface conditions and other site-specific prerequisites. The observational method as a practical engineering approach in tunnelling projects allows the designer to employ formal approaches towards design uncertainties by the installation of appropriate monitoring system and allows design optimization during construction such as the NATM approach.

In this research, firstly characteristics, limitations, problems and hazards of Niayesh road tunnel project were presented. Then geotechnical, structural and geodetic monitoring plan of this project considering its positioning in densely populated urban set were introduced. Observational method was applied to the Niayesh tunnel project to conduct modification of design to suit encountered ground conditions considering monitoring and observations results and experiences gained during construction. Based on observational method application, the project costs were decreased more than 35 US million dollars and excavation rate was increased more than 65 percent. Excavation phase of the project was finished three months sooner than time scheduling.

2 CONCLUSION

In modern engineering practices, the Observational Method is a way to optimize the design of a structure by continuously monitoring its behaviour during construction. This method offers significant advantages of cost minimization and avoids the over-design. Also it is a prudent way to identify possible stability problems and modify the construction and safety requirements in a timely manner. There are two main elements fundamental to the Observational Method. The existence of a carefully matched monitoring system for the type of the work, which will provide valuable performance related data and a mechanism to use these data in order to optimize the design itself and apply judgment more safely on the future stages of the construction. The main consequences of applying observational method and design modifications in Niayesh tunnel project consists:

Better control of the ground surface settlements, Better control of the tunnelling adjacent structures and decreasing tunnelling effect on the buildings, Decreasing the cost of the project more than 35 million US dollars, Finishing the excavation activities approximately 3 months ahead of the project schedule.